

CLAIMS

1. A display device providing a gray scale display by controlling in accordance with an input video signal individual
5 pixels on a display panel so that each pixel emits light or does not emit light in individual sub-fields that are defined by dividing one field and arranged on a time base in a prescribed order, said sub-fields being weighted to represent gray levels:

wherein said plurality of sub-fields are weighted in such
10 a way that at least one non-display gray level which cannot be displayed by combining said plurality of sub-fields is arranged between displayable gray levels by combining said plurality of sub-fields,

and wherein said display device comprises,

15 diffusion means receiving said video signal for, when said video signal represents said non-display gray level, diffusing temporally and/or spatially a difference between said non-display gray level and one of said display gray levels so that said non-display gray level can be equivalently
20 displayed with said display gray levels;

sub-field correspondence means for converting a video signal representing one field output from said diffusion means into a video signal representing individual sub-fields; and

emitting means for controlling said pixels on said
25 display panel so that each pixel emits light or does not emit

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light in said individual sub-fields, in accordance with said video signal representing said individual sub-fields output from said sub-field correspondence means.

- 5 2. The display device according to claim 1, wherein said diffusion means includes:

gray level conversion means for converting said non-display gray level into one of said display gray levels that is close to said non-display gray level, and

- 10 error diffusion means for diffusing, when said non-display gray level is converted into said one of said display gray levels by said gray level conversion means, a difference between said non-display gray level and said one of said display gray levels to pixels around a pixel having said non-display
15 gray level.

3. The display device according to claim 1, wherein said diffusion means includes:

- dither diffusion means for alternately adding or
20 subtracting a difference between said non-display gray level and one of said display gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

- 25 4. The display device according to claim 1, wherein at least

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two continuous non-display gray levels are included between said display gray levels, and

said diffusion means includes:

dither diffusion means for alternately adding or
5 subtracting a difference between one non-display gray level included in said at least two continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

10 gray level conversion means for converting another non-display gray level included in said at least two continuous non-display gray levels into a gray level close to said another non-display gray level among said display gray levels and a gray level rendered displayable by said dither diffusion means,
15 and

error diffusion means for diffusing, when said another non-display gray level is converted by said gray level conversion means, a difference between said another non-display gray level and the converted gray level to pixels around
20 a pixel having said another non-display gray level.

5. The display device according to claim 1, wherein said video signal is a digital video signal expressed by a plurality of bits,

25 and wherein said display device further comprises,

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lower diffusion means receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

selection means for selecting an output of said diffusion means when the gray level of the digital video signal output from said lower diffusion means is not less than the minimum value of said non-display gray level and for selecting an output of said lower diffusion means when the gray level of the digital video signal output from said lower diffusion means is less than the minimum value of said non-display gray level and for outputting the selected output to said sub-field correspondence means.

6. The display device according to claim 1, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display device further comprises,

lower diffusion means receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least

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significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

selection means for selecting the digital video signal
5 not yet diffused by said lower diffusion means when the gray level of the digital video signal output from said lower diffusion means is not less than the minimum value of said non-display gray level and for selecting an output of said lower diffusion means when the gray level of the digital video signal
10 output from said lower diffusion means is less than the minimum value of said non-display gray level,

and wherein said diffusion means includes dither diffusion means receiving the digital video signal output from said selection means, for alternately adding or subtracting
15 a difference between said non-display gray level and a display one of gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

7. The display device according to claim 1, wherein said video
20 signal is a digital video signal expressed by a plurality of bits,

at least two continuous non-display gray levels are included between said display gray levels,

and wherein said display device further comprises,

25 lower diffusion means receiving said digital video

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signal, for diffusing between fields or between pixels data
of a bit lower by one digit than a bit in said digital video
signal corresponding to a minimum gray level expressed by the
least significant sub-field having the minimum weight among
5 weights representing gray levels, so as to display a gray level
which is half said minimum gray level,

selection means for selecting an output of said diffusion
means when the gray level of the digital video signal output
from said lower diffusion means is not less than the minimum
10 value of said non-display gray level and for selecting an output
of said lower diffusion means when the gray level of the digital
video signal output from said lower diffusion means is less
than the minimum value of said non-display gray level, and

dither diffusion means receiving the digital video
15 signal output from said selection means, for alternately adding
or subtracting a difference between one non-display gray level
included in said at least two continuous non-display gray
levels and one of said display gray levels that is close to
said one non-display gray level to diffuse between fields or
20 between pixels,

said diffusion means includes:

gray level conversion means for converting another
non-display gray level included in said at least two continuous
non-display gray levels into a gray level close to said another
25 non-display gray level among said display gray levels and a

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gray level rendered displayable by said dither diffusion means,
and

error diffusion means for diffusing, when said another
non-display gray level is converted by said gray level
5 conversion means, a difference between said another non-
display gray level and the converted gray level to pixels around
a pixel having said another non-display gray level.

8. A display method for providing a gray scale display by
10 controlling in accordance with an input video signal individual
pixels on a display panel so that each pixel emits light or
does not emit light in individual sub-fields that are defined
by dividing one field and arranged on a time base in a prescribed
order, said sub-fields being weighted to represent gray levels:

15 wherein said plurality of sub-fields are weighted in such
a way that at least one non-display gray level which cannot
be displayed by combining said plurality of sub-fields is
arranged between displayable gray levels by combining said
plurality of sub-fields,

20 and wherein said display method comprises the steps of,
receiving said video signal for, when said video signal
represents said non-display gray level, diffusing temporally
and/or spatially a difference between said non-display gray
level and one of said display gray levels so that said
25 non-display gray level can be equivalently displayed with said

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display gray levels;

converting a video signal representing one field processed in said step of diffusing into a video signal representing individual sub-fields; and

5 controlling said pixels on said display panel so that each pixel emits light or does not emit light in said individual sub-fields in accordance with said converted video signal representing said individual sub-fields.

10 9. The display method according to claim 8, wherein said step of diffusing includes the steps of:

converting said non-display gray level into one of said display gray levels that is close to said non-display gray level, and

15 diffusing, when said non-display gray level is converted into said one of said display gray levels, a difference between said non-display gray level and said one of said display gray levels to pixels around a pixel having said non-display gray level.

20 10. The display method according to claim 8, wherein said step of diffusing includes the step of:

alternately adding or subtracting a difference between said non-display gray level and one of said display gray levels
25 that is close to said non-display gray level to diffuse between

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fields or between pixels.

11. The display method according to claim 8, wherein at least two continuous non-display gray levels are included between
5 said display gray levels,

and wherein said step of diffusing includes the steps of:

alternately adding or subtracting a difference between one non-display gray level included in said at least two
10 continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

converting another non-display gray level included in said at least two continuous non-display gray levels to a gray
15 level close into said another non-display gray level among said display gray levels and a gray level rendered displayable in said step of adding or subtracting to diffuse, and

diffusing, when said another non-display gray level is converted, a difference between said another non-display gray
20 level and the converted gray level to pixels around a pixel having said another non-display gray level.

12. The display method according to claim 8, wherein said video signal is a digital video signal expressed by a plurality of
25 bits,

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and wherein said display method further comprises the steps of,

receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

selecting the digital video signal processed by diffusing temporally and/or spatially when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is not less than the minimum value of said non-display gray level or selecting the digital video signal obtained by diffusing said data of a bit lower by one digit when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is less than the minimum value of said non-display gray level.

13. The display method according to claim 8, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display method further comprises the steps of,

receiving said digital video signal for diffusing

between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

selecting the digital video signal not processed by diffusing said data of a bit lower by one digit when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is not less than the minimum value of said non-display gray level or selecting the digital video signal obtained by diffusing said data of a bit lower by one digit when the gray level of the digital video signal obtained by diffusing said data of a bit lower by one digit is less than the minimum value of said non-display gray level,

and wherein said step of diffusing temporally and/or spatially includes the step of receiving the digital video signal selected in said step of selecting, for alternately adding or subtracting a difference between said non-display gray level and one of gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

14. The display method according to claim 8, wherein said video signal is a digital video signal expressed by a plurality of

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bits, and

at least two continuous non-display gray levels are included between said display gray levels,

and wherein said display method further comprises the
5 steps of,

receiving said digital video signal for diffusing
between fields or between pixels data of a bit lower by one
digit than a bit in said digital video signal corresponding
to a minimum gray level expressed by the least significant
10 sub-field having the minimum weight among weights representing
gray levels, so as to display a gray level which is half said
minimum gray level,

selecting the digital video signal processed by
diffusing temporally and/or spatially when the gray level of
15 the digital video signal obtained by diffusing said data of
a bit lower by one digit is not less than the minimum value
of said non-display gray level or selecting the digital video
signal obtained by diffusing said data of a bit lower by one
digit when the gray level of the digital video signal obtained
20 by diffusing said data of a bit lower by one digit is less than
the minimum value of said non-display gray level, and

receiving the digital video signal selected in said step
of selecting, for alternately adding or subtracting a
difference between one non-display gray level included in said
25 at least two continuous non-display gray levels and one of said

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display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

and wherein said step of diffusing temporally and/or spatially includes the steps of,

5 converting another non-display gray level included in said at least two continuous non-display gray levels into a gray level close to said another non-display gray level among said display gray levels and a gray level rendered displayable in said step of adding or subtracting to diffuse, and

10 diffusing, when said another non-display gray level is converted, a difference between said another non-display gray level and the converted gray level to pixels around a pixel having said another non-display gray level.

15 15. A display device providing a gray scale display by controlling in accordance with an input video signal individual pixels on a display panel so that each pixel emits light or does not emit light in individual sub-fields that are defined by dividing one field and arranged on a time base in a prescribed
20 order, said sub-fields being weighted to represent gray levels:

 wherein said plurality of sub-fields are weighted in such a way that at least one non-display gray level which cannot be displayed by combining said plurality of sub-fields is arranged between displayable gray levels by combining said
25 plurality of sub-fields,

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and wherein said display device comprises,

a diffusion circuit that receives said video signal for, when said video signal represents said non-display gray level, diffusing temporally and/or spatially a difference between said non-display gray level and one of said display gray levels so that said non-display gray level can be equivalently displayed with said display gray levels;

a sub-field corresponder that converts a video signal representing one field output from said diffusion circuit into a video signal representing individual sub-fields; and

an emitting circuit that controls said pixels on said display panel so that each pixel emits light or does not emit light in said individual sub-fields, in accordance with said video signal representing said individual sub-fields output from said sub-field corresponder.

16. The display device according to claim 15, wherein said diffusion circuit includes:

a gray level conversion table that converts said non-display gray level into one of said display gray levels that is close to said non-display gray level, and

an error diffusion circuit that diffuses, when said non-display gray level is converted into said one of said display gray levels by said gray level conversion table, a difference between said non-display gray level and said one

of said display gray levels to pixels around a pixel having said non-display gray level.

17. The display device according to claim 15, wherein said
5 diffusion circuit includes:

a dither diffusion circuit that alternately adds or subtracts a difference between said non-display gray level and one of said display gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

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18. The display device according to claim 15, wherein at least two continuous non-display gray levels are included between said display gray levels, and

said diffusion circuit includes:

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a dither diffusion circuit that alternately adds or subtracts a difference between one non-display gray level included in said at least two continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or
20 between pixels,

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a gray level conversion table that converts another non-display gray level included in said at least two continuous non-display gray levels into a gray level close to said another non-display gray level among said display gray levels and a
25 gray level rendered displayable by said dither diffusion

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circuit, and

an error diffusion circuit that diffuses, when said another non-display gray level is converted by said gray level conversion table, a difference between said another non-
5 display gray level and the converted gray level to pixels around a pixel having said another non-display gray level.

19. The display device according to claim 15, wherein said video signal is a digital video signal expressed by a plurality
10 of bits,

and wherein said display device further comprises,

a lower diffusion circuit that receives said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital
15 video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

a selection circuit that selects an output of said
20 diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is not less than the minimum value of said non-display gray level and selects an output of said lower diffusion circuit when the gray level of the digital video signal output from said lower
25 diffusion circuit is less than the minimum value of said

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non-display gray level and outputs the selected output to said sub-field corresponder.

20. The display device according to claim 15, wherein said
5 video signal is a digital video signal expressed by a plurality of bits,

and wherein said display device further comprises,

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10 a lower diffusion circuit that receives said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

15 a selection circuit that selects the digital video signal not yet diffused by said lower diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is not less than the minimum value of said non-display gray level and selects an output of said lower
20 diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is less than the minimum value of said non-display gray level,

and wherein said diffusion circuit includes a dither diffusion circuit that receives the digital video signal output
25 from said selection circuit, for alternately adding or

subtracting a difference between said non-display gray level and one of gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

5 21. The display device according to claim 15, wherein said video signal is a digital video signal expressed by a plurality of bits,

at least two continuous non-display gray levels are included between said display gray levels,

10 and wherein said display device further comprises,

a lower diffusion circuit that receives said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed
15 by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level,

a selection circuit that selects an output of said diffusion circuit when the gray level of the digital video
20 signal output from said lower diffusion circuit is not less than the minimum value of said non-display gray level and selects an output of said lower diffusion circuit when the gray level of the digital video signal output from said lower diffusion circuit is less than the minimum value of said
25 non-display gray level, and

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a dither diffusion circuit that receives the digital video signal output from said selection circuit, for alternately adding or subtracting a difference between one non-display gray level included in said at least two continuous non-display gray levels and one of said display gray levels that is close to said one non-display gray level to diffuse between fields or between pixels,

said diffusion circuit includes:

a gray level conversion table that converts another non-display gray level included in said at least two continuous non-display gray levels into a gray level close to said another non-display gray level among said display gray levels and a gray level rendered displayable by said dither diffusion circuit, and

an error diffusion circuit that diffuses, when said another non-display gray level is converted by said gray level conversion table, a difference between said another non-display gray level and the converted gray level to pixels around a pixel having said another non-display gray level.

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22. A display device providing a gray scale display by controlling in accordance with an input video signal individual pixels on a display panel so that each pixel emits light or does not emit light in individual N (N: natural number of not less than 1) sub-fields SF1, SF2, ..., SFN that are defined by

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dividing one field and arranged on a time base in a prescribed order:

wherein said N sub-fields SF1, SF2, ..., SFN are weighted to represent gray levels and said N sub-fields SF1, SF2, ...,
5 SFN have small or equal weights in this order, and

said N sub-fields SF1, SF2, ..., SFN include at least one such sub-field SFM that a difference between the weight of the sub-field SFM and the sum of the weights from the sub-field SF1 to the sub-field SF(M-1) exceeds the weight of the sub-field
10 SF1, whereby

the gray scale of the video signal includes at least one non-display gray level non-displayable by combining said N sub-fields between displayable gray levels by combining said N sub-fields,

15 and wherein said display device comprises,

conversion means for, when the gray scale of said input video signal is said non-display gray level, converting the gray scale of said input video signal into one of said display gray levels that is close to said non-display gray level.

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23. The display device according to claim 22, further comprising diffusion means for diffusing temporally and/or spatially a difference between said non-display gray level and one of said display gray levels so as to equivalently display
25 said non-display gray level with said one of said display gray

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levels that is converted by said conversion means and close to said non-display gray level.

24. The display device according to claim 23, wherein said
5 diffusion means includes:

dither diffusion means for alternately adding or subtracting between fields or between pixels a difference between said non-display gray level and one of said display gray levels that is close to said non-display gray level, so
10 as to display said non-display gray level with said one of said display gray levels that is close to said non-display gray level.

25. The display device according to claim 23, wherein said
15 diffusion means includes:

error diffusion means for diffusing a difference between said non-display gray level and said one of said display gray levels to pixels around a pixel having said non-display gray level.

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26. A display device providing a gray scale display by controlling in accordance with an input video signal individual pixels on a display panel so that each pixel emits light or does not emit light in individual N (N: natural number of not
25 less than 1) sub-fields SF1, SF2, ..., SFN that are defined by

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dividing one field and arranged on a time base in a prescribed order:

wherein said N sub-fields SF1, SF2, ..., SFN are weighted to represent gray levels and said N sub-fields SF1, SF2, ..., SFN have small or equal weights in this order, and

said N sub-fields SF1, SF2, ..., SFN include at least one such sub-field SFM that a difference between the weight of the sub-field SFM and the sum of the weights from the sub-field SF1 to the sub-field SF(M-1) exceeds twice the weight of the sub-field SF1, whereby

the gray scale of the video signal includes at least two continuous non-display gray levels non-displayable by combining said N sub-fields between displayable gray levels by combining said N sub-fields and said at least two non-display gray levels belong to a first group or a second group respectively,

and wherein said display device comprises,

first conversion means for, when the gray scale of the input video signal is a non-display gray level of the first group, converting the gray scale of said input video signal into a non-display gray level of the second group that is close to said non-display gray level of the first group or one of said display gray levels that is close to said non-display gray level of the first group; and

second conversion means for, when the gray scale of the

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input video signal is a non-display gray level of the second group or said non-display gray level of the second group converted by said first conversion means, converting the gray scale of said input video signal into one of said display gray levels that is close to said non-display gray level of the second group.

27. The display device according to claim 26, further comprising:

10 error diffusion means for diffusing a difference between said non-display gray level of the first group and said non-display gray level of the second group or said one of said display gray levels converted by said first conversion means to pixels around a pixel having said non-display gray level of the first group, and

dither diffusion means for alternately adding or subtracting a difference between said non-display gray level of the second group and said one of said display gray levels converted by said second conversion means, so as to display said non-display gray level of the second group with said one of said display gray levels that is close to said non-display gray level of the second group.

28. The display device according to claim 23, wherein said video signal is a digital video signal expressed by a plurality

of bits,

and wherein said display device further comprises,

lower diffusion means receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

selection means for selecting an output of said diffusion means when the gray level of the digital video signal output from said lower diffusion means is not less than the minimum value of said non-display gray level and for selecting to display an output of said lower diffusion means when the gray level of the digital video signal output from said lower diffusion means is less than the minimum value of said non-display gray level.

29. The display device according to claim 23, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display device further comprises,

lower diffusion means receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal

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corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

5 selection means for selecting the digital video signal not yet diffused by said lower diffusion means when the gray level of the digital video signal output from said lower diffusion means is not less than the minimum value of said non-display gray level and for selecting an output of said lower
10 diffusion means when the gray level of the digital video signal output from said lower diffusion means is less than the minimum value of said non-display gray level,

 and wherein said diffusion means includes dither diffusion means receiving the digital video signal output from
15 said selection means, for alternately adding or subtracting a difference between said non-display gray level and one of gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

20 30. The display device according to claim 27, wherein said video signal is a digital video signal expressed by a plurality of bits,

 at least two continuous non-display gray levels are included between said display gray levels,

25 and wherein said display device further comprises,

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lower diffusion means receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level,

selection means for selecting to display an output of said lower diffusion means when the gray level of the digital video signal output from said lower diffusion means is less than the minimum value of said non-display gray level.

31. A display method for providing a gray scale display by controlling in accordance with an input video signal individual pixels on a display panel so that each pixel emits light or does not emit light in individual N (N: natural number of not less than 1) sub-fields SF1, SF2, ..., SFN that are defined by dividing one field and arranged on a time base in a prescribed order:

wherein said N sub-fields SF1, SF2, ..., SFN are weighted to represent gray levels and said N sub-fields SF1, SF2, ..., SFN have small or equal weights in this order, and

said N sub-fields SF1, SF2, ..., SFN include at least one such sub-field SFM that a difference between the weight of the sub-field SFM and the sum of the weights from the sub-field

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SF1 to the sub-field SF(M-1) exceeds the weight of the sub-field SF1, whereby

the gray scale of the video signal includes at least one non-display gray level non-displayable by combining said N
5 sub-fields between displayable gray levels by combining said N sub-fields,

and wherein said display method comprises,

a conversion step of, when the gray scale of the input video signal is said non-display gray level, converting the
10 gray scale of said input video signal into one of said display gray levels that is close to said non-display gray level.

32. The display method according to claim 31, further comprising a diffusion step of diffusing temporally and/or
15 spatially a difference between said non-display gray level and said one of said display gray levels converted in said conversion step, so as to equivalently display said non-display gray level with said one of said display gray levels.

20 33. The display device according to claim 32, wherein said diffusion step includes:

a dither diffusion step of alternately adding or subtracting between fields or between pixels a difference between said non-display gray level and said one of said display
25 gray levels that is close to said non-display gray level, so

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as to display said non-display gray level with said one of said display gray levels.

34. The display method according to claim 32, wherein said
5 diffusion step includes:

an error diffusion step of diffusing a difference between said non-display gray level and said one of said display gray levels to pixels around a pixel having said non-display gray level.

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35. A display method for providing a gray scale display by controlling in accordance with an input video signal individual pixels on a display panel so that each pixel emits light or does not emit light in individual N (N: natural number of not
15 less than 1) sub-fields SF1, SF2, ..., SFN that are defined by dividing one field and arranged on a time base in a prescribed order:

wherein said N sub-fields SF1, SF2, ..., SFN are weighted to represent gray levels and said N sub-fields SF1, SF2, ...,
20 SFN have small or equal weights in this order, and

said N sub-fields SF1, SF2, ..., SFN include at least one such sub-field SFM that a difference between the weight of the sub-field SFM and the sum of the weights from the sub-field SF1 to the sub-field SF(M-1) exceeds twice the weight of the
25 sub-field SF1, whereby

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the gray scale of the video signal includes at least two continuous non-display gray levels non-displayable by combining said N sub-fields between displayable gray levels by combining said N sub-fields and said at least two non-display gray levels belong to a first group or a second group respectively,

and wherein said display method comprises,

a first conversion step of, when the gray scale of the input video signal is a non-display gray level of the first group, converting the gray scale of said input video signal into a non-display gray level of the second group that is close to said non-display gray level of the first group or one of said display gray levels that is close to said non-display gray level of the first group; and

a second conversion step of, when the gray scale of the input video signal is a non-display gray level of the second group or said non-display gray level of the second group converted in said first conversion step, converting the gray scale of said input video signal into one of said display gray levels that is close to said non-display gray level of the second group.

36. The display method according to claim 35, further comprising:

an error diffusion step of diffusing a difference between

said non-display gray level of the first group and said non-display gray level of the second group or said one of said display gray levels converted in said first conversion step to pixels around a pixel having said non-display gray level of the first group and,

5 a dither diffusion step of alternately adding or subtracting a difference between said non-display gray level of the second group and said one of said display gray levels converted in said second conversion step, so as to display said non-display gray level of the second group with said one of said display gray levels that is close to said non-display gray level of the second group.

37. The display method according to claim 32, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display method further comprises,
a lower diffusion step of receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

25 a selection step of selecting an output of said diffusion

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step when the gray level of the digital video signal output from said lower diffusion step is not less than the minimum value of said non-display gray level or selecting to display an output of said lower diffusion step when the gray level of the digital video signal output from said lower diffusion step is less than the minimum value of said non-display gray level.

38. The display method according to claim 32, wherein said video signal is a digital video signal expressed by a plurality of bits,

and wherein said display method further comprises,

a lower diffusion step of receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights representing gray levels, so as to display a gray level which is half said minimum gray level, and

a selection step of selecting the digital video signal not yet diffused in said lower diffusion step when the gray level of the digital video signal output from said lower diffusion step is not less than the minimum value of said non-display gray level or selecting an output of said lower diffusion step when the gray level of the digital video signal output from said lower diffusion step is less than the minimum

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value of said non-display gray level,

and wherein said diffusion step includes a dither diffusion step of receiving the digital video signal output from said selection step, for alternately adding or subtracting
5 a difference between said non-display gray level and one of gray levels that is close to said non-display gray level to diffuse between fields or between pixels.

39. The display method according to claim 36, wherein said
10 video signal is a digital video signal expressed by a plurality of bits,

at least two continuous non-display gray levels are included between said display gray levels,

and wherein said display method further comprises,

15 a lower diffusion steps of receiving said digital video signal for diffusing between fields or between pixels data of a bit lower by one digit than a bit in said digital video signal corresponding to a minimum gray level expressed by the least significant sub-field having the minimum weight among weights
20 representing gray levels, so as to display a gray level which is half said minimum gray level, and

a selection step of selecting to display an output of said lower diffusion step when the gray level of the digital video signal output from said lower diffusion step is less than
25 the minimum value of said non-display gray level.

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